

**Climatological Data for December, 1909.**  
**DISTRICT No. 10, GREAT BASIN.**

ALFRED H. THIESSEN, District Editor.

**GENERAL CLIMATOLOGICAL CONDITIONS.**

The most important features of the weather for December were the continuously low temperatures which averaged much below normal, and the abundant moisture.

**TEMPERATURE.**

The mean temperature for the district, as a whole, was 20.8°, which was 8.4° below normal. All stations reported mean temperatures below normal, and at many stations there were only a few days in the month when normal temperatures prevailed. The highest mean temperatures occurred in the western portion of Nevada, southwest portion of Utah, and in Oregon; the lowest means occurred in eastern Nevada and in Wyoming. The mean temperature ranged from 6.0° at Border, Wyo., to 37.6° at Jean, Nev. As a rule, the greatest deficiencies were reported in the mountains of Utah and in northeastern Nevada, and the least in western Nevada.

The month began with temperatures generally below normal and so continued during the first decade, but on the 10th the pressure was low over the eastern slope of the Rockies and an area of high pressure appeared off the Pacific coast, resulting in much colder weather over the entire Great Basin. A succession of high pressure areas swept across this district during nearly all the remaining portion of the month, resulting in average pressure much above normal, which condition was accompanied by unusually cold weather.

There were two periods of very cold weather. The first extended from the 3d to the 6th and the second from the 10th to the 30th. During the first period the lowest temperatures for the month occurred in Oregon, Nevada, and California; and during the second period the lowest temperatures were reported in Utah, Idaho, and Wyoming. This last cold spell was remarkable for its length and its very low minimum temperatures.

The section director of Wyoming says: "The month was one of the coldest Decembers ever known in southwestern Wyoming. At Border, where records have been kept for 8 years, it was the coldest December on record; but at Evanston, where records have been kept for about 13 years, December, 1898, averaged 0.1° lower than December, 1909." In Utah it was the coldest December on record. December, 1895, is on record as the coldest previous December, but the present December was nearly 2° colder.

The lowest minimum temperature recorded was -30° at Border, Wyo., on the 30th. The highest maximum temperature was 70° at Jean, Nev., on the 2d.

**PRECIPITATION.**

As usual the monthly precipitation was very unevenly distributed, but was above normal at nearly every station. For the district, as a whole, it averaged 1.88 inches, which was 1.57 inches above normal. The greatest amounts fell in central Utah, western Nevada, and east-central California; the least in south-central Nevada. In Utah and Nevada the average precipitation was about twice the normal amount. Many stations reported very large amounts, as 10.60 inches at Lewers Ranch, Nev., and 12.21 inches at Truckee, Cal.

In Utah precipitation occurred at some point in the State each day during the entire month, except from the 25th to the 30th. It was less general in the remainder of the district. Almost every station reported heavy precipitation on the last day of the month. At many stations the precipitation on the last day of the month was in the form of rain which, together with the rapid rise in temperature on that day, caused floods

and washouts at many points. This will be treated more fully in next month's report when reliable information will have been obtained.

The precipitation occurred principally as snow, and reports show that much more than the normal amounts were stored in the mountains. The warm weather on the last day of the month, together with the rain, resulted in the snow packing, a condition favorable to its long retention for next summer's supply.

Large amounts of snow were generally reported. In Utah the greatest amounts were 60 inches at Marion and 72 inches at Greyson. At Deer Park, Cal., which is 7 miles northwest of Tahoe City, the observer reported 75 inches, and at Glen Alpine, Cal., which is 8 miles southwest of Lake Tahoe, 70 inches were recorded. These are some of the largest amounts, and it is estimated that, as a rule, nearly double the normal amount of snow fell in Nevada, while in Utah much more than normal amounts have been measured.

**MISCELLANEOUS PHENOMENA.**

There was an average of 7 rainy days, 11 clear days, 7 partly cloudy days, and 13 cloudy days for the entire district.

Hail fell at Battle Mountain on the 12th, Carson Dam on the 5th, and Cherry Creek on the 2d, 7th, and 9th.

**NOTES.**

The section director of California writes: "The ice harvest from the lakes in east-central California will be the heaviest for many years. These lakes supply the ice for northern California and also for the Central Pacific Railroad."

It is noted that Senator Heyburn has introduced a bill authorizing the collection of statistics and information relative to the irrigation of arid lands. It instructs the Director of the Census of 1910 to collect and publish all available information relating to the quantity of land irrigated in the arid regions of the United States, and in each State and county in that section, under federal or State laws; the approximate value of lands per acre before irrigation and since water has been applied; the amount, character and value of irrigated crops produced, the location of the various projects and method of construction, with facts as to their physical condition, approximate cost per acre of putting water on the land, and such other information as may be of interest and value pertaining to the reclamation of the arid lands of the West.

**THE AGRICULTURAL ENGINEER AND THE WEATHER BUREAU.**

By THOS. H. MEANS, M. Amer. Soc. C. E. Project Engineer of the Truckee-Carson Project.

Meteorological records are very essential in the study of those problems which fall to the lot of the engineer who deals with agricultural matters. To-day, perhaps, more than at any other time engineers are being called upon to make investigations and build works in connection with new or improved agricultural developments. The profession of agricultural engineer, so long an important one in Europe, is therefore becoming recognized in the United States. The agricultural engineer is called on to investigate irrigation and drainage works, report on schemes of farm management, control of forests, and so forth. His work is exceedingly varied, he may be called upon to build telephone lines in mountainous regions to maintain communication when the snows are too deep for travel, or he may have to build levees and dams in the valley or flood plain of a large river. Hardly any phase of his work can be satisfactorily accomplished with-

out the consideration of and dependence on meteorological data and he therefore is vitally interested in the work of the Weather Bureau as it is the source of much of his fundamental data.

Fifteen years' apprenticeship in the study of problems presented to the agricultural engineer have given the writer a wholesome respect for the work of the Weather Bureau, and a desire to see its scope extended and its valuable records maintained without interruption.

The agricultural engineer has two uses for Weather Bureau records, one in connection with his consideration of agricultural problems, and the other in his studies for the building of works of various sorts.

In the investigation of agricultural problems the engineer is often required to report on the agricultural possibilities of a country where little farming is carried on. He seldom finds well-equipped Weather Bureau stations in such localities, and has to depend on near-by stations in locations similar as regards elevation, topography, and exposure. By comparison of vegetation and the collection of a short series of observations he can generally form some fairly accurate measure of the climate of the district under consideration. The second point which is important here is that weather stations in new and remote localities nearly always prove useful sooner or later. There is hardly any part of the United States which will not become valuable and be inhabited in the next 50 years, and it is none too soon to commence to collect records. In many areas much good is already coming from the records being gathered from remote mountain stations during the winter time, and as water resources are developed and conserved for irrigation and power these stations will increase in number and importance. Commercial organizations are putting in stations where the Weather Bureau can not take up the work and much more of this kind of extension is likely to take place in the near future. There is considerable advantage in having any class of work handled by experts, and it is generally true that the various weather services of federal or State Governments can collect, preserve, and publish these records in better shape than can individual corporations. For this reason the extension of the United States Weather Bureau work in some regions seems very necessary.

In the consideration of agricultural problems, frost records, sunshine, hail, wind velocities, extremes of heat and cold, daily variation of temperature, and rainfall by months and seasons are most important. Humidity, evaporation, rate of rainfall, snow depths, fogs, etc., are of less importance, though exceedingly valuable from other engineering standpoints.

Wind velocities, duration of winds, direction of extreme winds, and so forth have an important bearing on the kinds of crops which can be grown and the kinds of soil which can be profitably handled.

Frost records seem difficult to collect and are often very local in value. A light frost which nips the beans in the observer's garden is apt to be reported as a killing frost and go into the records as such. Such a record would be very misleading in later years. If some classification could be given of the severity of frosts, other than those now in use, light frost and killing frost, it is thought the records would prove of more permanent value.

The other elements which go to make up a complete meteorological report on any locality are all important, no one of them can be omitted without loss, yet when it is not possible to collect all the various kinds of records a partial list is of much value. The distribution of regular Weather Bureau stations where all classes of records are kept is now sufficient to enable one to interpolate and supply missing data for the less broadly equipped cooperative stations.

The space allotted will not permit a wide discussion of the general value of weather records to agricultural engineers or permit a full view of the problem, and a few important problems only will therefore be touched upon.

Many times during a season the active engineer is required to consider questions of the run-off from stream watersheds. Often no complete records of flow are available and even where stream flow measurements have been made the period over which they extend is none too long. Precipitation records generally extend over much longer periods and the engineers have to consider the relation between precipitation and run-off. This is certainly one of the most unsatisfactory pieces of work one can undertake. There is no question but that there is some general relation between stream flow and run-off, but there are so many factors which enter to complicate the problem that it has never been satisfactorily solved. We are coming nearer a solution every year, and now that more attention is being paid to collection of records from the higher parts of the watersheds, we have a more hopeful view-point than ever before. It is to be hoped that every effort will be made to collect weather data from such places and in such manner as will enable us to make some estimate of the relation between these figures.

Evaporation studies have been carried on at intervals for many years, but the sum total of our knowledge of the evaporation from bodies of water is not great. The recent activity of the Weather Bureau in this matter is appreciated, and it is hoped our knowledge of the subject will be greatly increased.

The engineer who is operating a water power plant or an irrigation project is much interested in the matter of long range prediction of the character of the season. If we could be informed in advance whether a season is apt to be wet or dry, the information would be of untold value. So far very little in the way of such prediction has been attempted, but some hope is extended to us that in time it may be possible to predict the general character of the weather for longer periods than now. Every extension of the period of prediction will be immensely valuable to us. Many of our western streams are subject to sudden and violent floods, and the collection of data regarding precipitation in the mountains will help the man in the plains to be prepared for these floods as well as for periods of low water. There is some hope that we will be able also to predict from these records something of the character and amount of run-off considerably in advance of the time when it occurs.

The matter of publication of weather records has always been troublesome to the busy man, and the division along State lines a source of annoyance, but this has been corrected by the new method of publication in hydrographic districts. The amount of library material which must be collected by the individual engineer is very great and this method of publication will enable the filing of all weather records one person is usually interested in, in compact form.

It is readily seen that weather records are the ground floor facts on which many important engineering problems are based. These records are becoming more important yearly, and with the addition of the new lines of work recently started future records will be most satisfactory. Records from remote localities are often the most important and the extension of the Weather Service over new territory will be very valuable to future generations.

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NOTE.—Referring to remarks made above on the classification of frosts it may be said that the frost data of any place would have greater value if, with the report of a frost, the observer would mention just what damage was done.—A. H. T.

#### PRACTICAL BENEFITS OF THE WEATHER BUREAU.

By HORACE W. SHELEY, Assoc. M. Am. Soc. C. E.

Among the many bureaus maintained by the Federal Government for the purpose of collecting scientific data for the use of its citizens there is none that deals with the subject of more general interest to the public than that of the Weather